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# Indian Standard

## METHOD FOR PRECISE CONVERSION OF INCH AND METRIC DIMENSIONS TO ENSURE INTERCHANGEABILITY

(Fourth Reprint AUGUST 1990)

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# Indian Standard

## METHOD FOR PRECISE CONVERSION OF INCH AND METRIC DIMENSIONS TO ENSURE INTERCHANGEABILITY

### 0. FOREWORD

**0.1** This Indian Standard was adopted by the Indian Standards Institution on 3 September 1957, on approval by the Engineering Division Council of the draft finalized on 31 August 1957, by the Engineering Standards Sectional Committee.

**0.2** The Union Parliament having adopted the Standards of Weights and Measures Act, 1956, the Government of India is now concerned with expediting the introduction of the metric system of weights and measures in various branches of commerce and industry. As a part of this endeavour, the Indian Standards Institution is expected to change all its standards to the new basis of measurement so as to furnish at the earliest possible stage the necessary guidance to industry and commerce for changing over their operations from the present set of units to metric units. The programme of the Institution also includes the evolution of appropriate procedures to guide the conversion of existing standards in a uniform and rational manner. The Indian Standard Guide for Inter-Conversion of Values from One System of Units to Another (IS : 787-1956) lays down the basic principles to be followed in all conversion problems relating to any branch of work. A part of IS : 787-1956 deals with the principles of inter-conversion of inch and millimetre dimensions. The treatment of the subject presented in IS : 787-1956 is, however, not considered detailed enough for adequate guidance of those concerned with inch-millimetre conversion of dimensions for interchangeability as a daily routine. In order to avoid the necessity for detailed consideration of each conversion problem in the light of the basic principles, and to reduce the related calculations involved, this standard is being issued. It prescribes readymade and simple rules and detailed tables, which should facilitate the work of engineers, designers, draftsmen, shop-workers and others.

**0.3** During the period of the change-over, many situations will arise where dimensions expressed in inches will have to be converted to millimetres and vice versa to ensure interchangeability. Some of these instances may be as follows:

- a) Most drawings at present in use being on inch basis will have to be converted to millimetres;
- b) Parts manufactured and inspected in terms of one set of units may be required to be interchangeable with parts manufactured

and inspected in terms of the other set of units;

- c) Parts detailed on inch drawings may have to be manufactured on machines calibrated in metric units, or vice versa;
- d) Parts manufactured according to inch drawings may have to be inspected with tools and gauges based on millimetre dimensions, or vice versa;
- e) Inch-based stock materials may have to be used to produce metric-based parts, or vice versa;
- f) Basic standards of stock materials and all engineering design codes and practices shall have to be revised from inch basis to metric basis; but in this revision, many other considerations, besides the exact conversion of nominal dimensions, will be involved.

**0.4** In conversion of drawings it should be ensured that component parts made to drawings dimensioned in one system should be interchangeable with parts made to drawings dimensioned in the other system. Such interchangeability can, of course, be ensured by making conversion to a very high degree of accuracy, that is, by calculating the converted size to a large number of decimal places. In practice, however, although a part has certain limits of size mentioned in its drawings, parts with actual limits equal to drawing limits plus or minus the accuracy of measurement employed, will be accepted in inspection. There is little purpose served, therefore, by converting to a precision which is finer than that of the method of measurement which is likely to be employed in inspecting the part.

**0.4.1** For example, the limits of the diameter of a crank pin, are given as 2.280 in and 2.278 in. A micrometer (graduated in 0.001 in) will normally be used for inspection. With such a micrometer it may be possible to estimate a reading to a fineness of 0.0001 in, but not to a greater degree of fineness. So if the actual diameter is 2.2801 in, it may be read by the micrometer as 2.280 in, and the part will be accepted. Similarly an actual diameter of 2.2779 in, may be read by the micrometer as 2.278 in, and the part will be accepted. Hence, while the drawing specifies limits of 2.280 in and 2.278 in in practice, parts within actual limits of 2.2801 in and 2.2779 in, will be accepted in inspection. When converting the inch limits

of this part to metric limits there is no purpose served by converting to a precision higher than 0.0001 in (or 0.0025 mm), if the converted value is rounded off to a fineness of 0.005 mm, the converted limits will not vary from the original limits by more than 0.0001 in (or 0.0025 mm) and parts made to the converted limits will, in practice, be interchangeable with parts made to original limits.

**0.5** The accuracy of measurement is primarily dependent on the basic accuracy of the measuring instrument employed; it is also affected by the skill of the inspector, the material from which the part is made and the nominal size, the surface finish and the errors of geometric form of the feature being measured.

**0.5.1** In good engineering practice the accuracy of measurement is of the order of  $\pm 2$  to  $\pm 4$  percent of the feature tolerance. With present-day measuring instruments and inspection techniques it is doubtful, however, whether a higher precision of measurement than about  $\pm 0.00003$  in (or  $\pm 0.75 \mu$ ) is quantitatively attainable. This figure corresponds to  $\pm 3$  percent of a feature tolerance of 0.001 in (or 0.025 mm), and to a progressively increasing percentage of the feature tolerance as the latter is reduced below 0.001 in. When converting limits, therefore, if the converted limits are rounded off to the nearest 5 percent of the feature tolerance where it exceeds 0.001 in (or  $2.5 \mu$ ), the maximum error in conversion will be 2.5 percent of the feature tolerance; if the converted limits are rounded off to the nearest 0.00005 in (or  $1 \mu$ ), when the feature tolerance is less than 0.001 in (or  $2.5 \mu$ ), the maximum error in conversion will be 0.000025 in (or  $0.6 \mu$ ). These errors are less than the accuracy of measurement and so effective dimensional interchangeability of parts made to original and converted limits will be achieved.

**0.6** Based on these considerations and those discussed in IS : 787-1956, a simplified set of rules has been evolved as given in the present standard. Certain definitions of terms and tables of conversions have also been included, which will facilitate understanding and practical application of the rules in day-to-day work. By following these rules, no difficulty should arise in converting precise dimensions expressed in terms of inches into

their metric equivalents or vice versa. The degree of accuracy that would result would be adequate to each individual conversion involved for all purposes, including design, manufacture, inspection and functionality.

**0.7** It must be particularly noted that this standard covers only the *precise* conversion of dimensions where it is required that the use of the original and the converted dimensions should lead to products which are freely interchangeable. This standard does not deal with the procedure for the conversion of national or industrial *standard* drawings from one system of measurement to another. It must be appreciated that, in the latter case, when converting nominal dimensions and standardized dimensions, several considerations have to be taken into account, besides the arithmetical conversion of given values. A brief treatment of this subject will be found in IS : 787-1956.

**0.8** Acknowledgement is due for the assistance derived from the following British Standards:

- B.S. 308:1953 ENGINEERING DRAWING PRACTICE
- B.S. 2517:1954 DEFINITIONS FOR USE IN MECHANICAL ENGINEERING
- B.S. 2856:1957 PRECISE CONVERSION OF INCH AND METRIC SIZES ON ENGINEERING DRAWINGS

**0.9** The present standard is one of the series of Indian Standards on numerical values, their inter-conversion, etc. Other standards in the series are:

- IS: 2-1949 RULES FOR ROUNDING OFF NUMERICAL VALUES
- IS: 3-1949 INCH-MILLIMETER CONVERSION FOR INDUSTRIAL USE
- IS: 786-1956 CONVERSION FACTORS AND CONVERSION TABLES
- IS: 787-1956 GUIDE FOR INTER-CONVERSION OF VALUES FROM ONE SYSTEM OF UNITS TO ANOTHER
- IS: 1020-1957 CONVERSION TABLES FOR ORDINARY USE

**0.10** This standard also requires reference to "IS : 696-1955 Code of Practice for General Engineering Drawings.

\*Since revised.

## 1. SCOPE

**1.1** This standard gives a simplified set of rules for the precise conversion of dimensions from inches to millimetres and vice versa to ensure interchangeability. The rules are meant for use particularly in the work of engineers, designers, draughtsmen and shop-workers.

**1.1.1** The following categories of dimensions are covered:

- a) Simple Feature Dimensions

- b) Positional Dimensions
- c) Datum Dimensions
- d) Untoleranced Dimensions
- e) Standard Feature Dimensions

## 2. TERMINOLOGY

**2.0** For the purpose of this standard, the following definitions shall apply.

**2.1 Feature** — An individual characteristic of a part, such as cylindrical surface, screw-thread, slot, flat surface, or profile.

**2.1.1 Standard Feature** — A feature whose shape and size have been fixed by a standard with a view to facilitating interchangeability of commonly occurring machine parts, such as screw threads for bolts and nuts, gear teeth for gears, splines for splined shafts, sheet and wire gauges, shapes and sizes of metallic sections including structural steel sections, etc.

**2.1.2 Positional Feature** — One of a group of features which is required to conform to a specified positional relationship with others in the group (for example see Fig 1, see also 2.2.2, 2.3.6 and 2.3.7)

**2.2 Dimension** — A geometrical element in a design, such as a length, diameter or angle, of which the size is specified.

**2.2.1 Size** — A general term denoting magnitude of any kind.

**2.2.2 Positional Dimension** — One which specifies the positional relationship of a feature with respect to another feature.

**2.2.3 Datum Dimension** — A theoretically exact dimension which locates a datum point, line, or plane at which a feature must be within certain limits of size. The term is also used to define a cross-sectional plane of a feature, the location of which may vary within specified limits (for examples see Fig 4 and 5).

**2.2.4 Design Dimension (or Size)** — The dimension (or size) which, in association with the limits of tolerance, serves to define the relevant design requirement (for examples see Table I).

**2.3 Tolerance** — The total amount of variation permitted for the size of a dimension, a positional relationship, or any other design requirement (for examples see Table I).

**2.3.1 Limits of Size (or Limiting Dimensions)** — The maximum and the minimum sizes (dimensions) within which the size (actual dimension) is permitted to vary; also termed upper and lower limits of size (for examples see Table I).

**2.3.2 Limits of Tolerance (or Tolerance Limits)** — The maximum amounts, positive and negative, by which the actual (or measured) dimension is permitted to depart from the design dimension (for examples see Table I).

**2.3.3 Bilateral Tolerance** — The tolerance in which variation is permitted in both directions from a design dimension or true position of a feature. The variation may be equal or unequal in the two directions (for examples see Table I).

**2.3.4 Unilateral Tolerance** — The tolerance in which variation is permitted only in one direction, positive or negative, from the design dimension or true position of a feature (for examples see Table I).

**2.3.5 Feature Tolerance** — The tolerance on the size of a feature, such as the diameter of a pin or hole, or the width of a slot, as distinct from the positional tolerance on the true position of the feature in relation to other features.

**2.3.6 Positional Tolerance** — The total amount of variation permitted for the location of a feature.

**TABLE I EXAMPLES TO ILLUSTRATE SOME OF THE TERMS DEFINED UNDER TERMINOLOGY**

(Clause 2)

*GIVEN DIMENSION	DESIGN DIMENSION	TOLERANCE	LIMITS OF TOLERANCE		LIMITING DIMENSION (LIMITS OF SIZE)		NATURE OF TOLERANCE
			Positive	Negative	Upper	Lower	
in	in	in	in	in	in	in	
21½	21.75	—	—	—	—	—	Nil
2½ ±0.001	2.500	0.002	+0.001	−0.001	2.501	2.499	Equal Bilateral
1½ { +0.002 −0.000 5	1.250 0	0.002 5	+0.002 0	−0.000 5	1.252 0	1.249 5	Unequal Bilateral
0.5 { +0 −0.000 3	0.500 0	0.000 3	+0.000 0	−0.000 3	0.500 0	0.499 7	Unilateral
3.562 3.559	—	0.003	—	—	3.562	3.559	—
mm	mm	mm	mm	mm	mm	mm	—
153.5	153.5	—	—	—	—	—	Nil
14.20 ±0.05	14.20	0.10	+0.05	−0.05	14.25	14.15	Equal Bilateral
3.400 { +0.001 −0.06	3.400	0.061	+0.001	−0.060	3.401	3.340	Unequal Bilateral
10.5+0.01	10.50	0.01	+0.01	−0.00	10.51	10.50	Unilateral
359 355	—	4	—	—	359	355	—

\*The different dimensions given as examples in this column represent the different ways in which one will come across dimensions on drawings, generally. The Indian Standard method of expressing numerical values requires all significant zeros to be included and non-significant zeros omitted as has been done in case of figures given under all other columns of the table (see also IS: 787-1956 and IS: 696-1955<sup>9</sup>).

\*Since revised.



Positional tolerance may be distributed bilaterally in a normal manner or in all directions round a centre (see Fig 1, 2 and 3, see also 2.3.7).

**2.3.7 Geometrical Positional Tolerance** — That positional tolerance in which the tolerance is distributed in all directions around the true geometrical position.

**NOTE** — It will be seen that the geometrical positional tolerance is twice the maximum permitted departure from the true geometrical position (see Fig 1 and 3).

**2.4 Fineness of Rounding** — The unit to which the value is rounded off. For example, 2.53 rounded off to a fineness of 0.1 will be 2.5.

### 3. BASIC DATA

**3.1 Rules for Rounding Off** — The converted numerical values of dimensions, tolerances, etc., shall be rounded off in accordance with rules specified in IS: 2-1949\* which may briefly be summarized as follows:

- Round off to the nearest digit, unless the unrounded value falls exactly midway between two possible adjacent rounded-off values, in which case choose the *even* rounded value.
- Use the most precise value known with all the available figures, for applying the above rule.

**3.2 Fineness of Rounding** — For the precise conversion of dimensions according to this standard, fineness of rounding shall be chosen from the values given in Table II in accordance with the magnitude of the tolerance in the original given dimension.

**TABLE II FINENESS OF ROUNDING FOR CONVERSION OF TOLERANCED DIMENSIONS**

TOLERANCE ON ORIGINAL DIMENSION		FINENESS OF ROUNDING
From	Up to But Not Including	
in	in	mm
0.000 05	0.01	0.001
0.01	0.1	0.01
0.1	1	0.1
mm	mm	in
0.001	0.05	0.000 05
0.05	0.5	0.000 1
0.5	5	0.001
5	50	0.01

**3.2.1** For tolerances finer than 0.000 05 in. and 0.001 mm, this table does not apply. Such fine tolerances may occur in certain type of high precision work, and must be dealt with as a special case in accordance with the basic principles enunciated in IS: 787-1956.

**3.3 Conversion Factor** — The basic conversion factor for inch-millimetre conversions shall be

$$1 \text{ inch} = 25.4 \text{ millimetres (exact).}$$

This is the legally recognized conversion factor for use in India according to the Standards of Weights and Measures Act, 1956.

**3.4 Conversion Tables** — With a view to eliminating the need for repeated calculations and thus minimizing chances of error, the following conversion tables are appended to this standard for use in converting dimensions:

#### Inches to Millimetres

Table IIIA Range: 1-100 in. (see P12)

Table IIIB Range: 0.001-1.000 in. (see P13)

Table IIIC Range: 0.000 01-0.001 00 in. (see P17)

Table IIID Range:  $\frac{1}{16}$  to 1 in. (see P18)

#### Millimetres to Inches

Table IVA Range: 1-1 000 mm (see P19)

Table IVB Range: 0.001-1.000 mm (see P23)

### 4. RULES FOR CONVERSION OF DIMENSIONS

#### 4.1 Simple Feature Dimensions

**RULE 1** — If limits of size are not directly stated in the given dimension, derive the limits by using the design dimension and tolerance limits given.

**RULE 2** — Convert the limits of size from the given units to the required units by the use of appropriate tables of inch to millimetre series (Tables IIIA, IIIB, IIIC and IIID) or millimetre to inch series (Tables IVA and IVB) as the case may require.

**RULE 3** — Find the tolerance of the feature and obtain from Table II, the appropriate fineness of rounding.

**RULE 4** — Using this fineness of rounding, round off the converted limits of size as obtained under Rule 2, in accordance with the rules specified in IS: 2-1949\* (see also 3.1).

**RULE 5** — If desired, the limits of size may be expressed in terms of design dimension together with plus and minus tolerance limits, for which purpose deal with the 3 cases that arise as follows:

- For Unilateral Tolerance** — Simply take the difference between the converted limits of size as the tolerance (see Example 3).
- For Equal Bilateral Limits** — Take the difference between the converted limits of size, and if this happens to be even, just divide by two to obtain the tolerance limit; if it is odd, subtract one in the last place before halving (see Example 2).
- For Unequal Bilateral Limits** — Convert the smaller of the two original tolerance limits to the required units by the use of the appropriate tables (as under

\*Since revised.

\*Since revised.

Rule 2) and round it off (as under Rule 4) to the same fineness of rounding as previously determined under Rule 3. Using this converted value as the smaller of the two converted tolerance limits, derive the other converted limit and the converted design dimension (see Example 1).

#### Example 1

Convert to millimetres  $2.4345 \pm 0.0006$  in  
 $\phantom{Convert to millimetres} - 0.00005$  in

By Rule 1 — Limits to be converted are:  
 $2.43510$  in. and  $2.43445$  in.

By Rule 2 — Look up the converted values of  
 $2$  in from Table IIIA as  $50.8$  mm  
 $0.435$  in } from Table IIIB as  $11.0490$  mm  
 $0.434$  in } from Table IIIB as  $11.0236$  mm  
 $0.00010$  in } from Table IIIC as  $0.002540$  mm  
 $0.00045$  in } from Table IIIC as  $0.011430$  mm

Add up the groups as required to obtain the converted values of the given limits:

$2.43510$ in	$2.43445$ in
$50.8$	$50.8$
$11.0490$	$11.0236$
$0.002540$	$0.011430$
$61.851540$ mm	$61.835030$ mm

By Rule 3 — Tolerance =  $0.0006 + 0.00005 = 0.00065$  in. From Table II, we find that for this tolerance, Fineness of Rounding =  $0.001$  mm.

By Rule 4 — Round off the millimetre converted limits to the fineness of  $0.001$  mm and obtain the answer as:

$61.852$  and  $61.835$  mm

By Rule 5(c) — These limits, if desired, may be expressed in terms of the design dimension and tolerance limits as follows:

Converted tolerance =  $61.852 - 61.835 = 0.017$  mm. From Table IIIC, the smaller of the two original limits of tolerance,

$0.00005$  in =  $0.001270$  mm,  
 which after rounding

=  $0.001$  mm

∴ Design size =  $61.835 + 0.001 = 61.836$  mm

and the converted size =  $61.836 \pm 0.001$  mm.

#### Example 2

Convert to millimetres  $1\frac{1}{4} \pm 0.03$  in

By Rule 1 —

$1\frac{1}{4}$  in =  $1.73438$  in [Table IIID]

∴ Limits of size:

$1.76438$  in  $1.70438$  in

By Rule 2 —

$25.4$	$25.4$	[Table IIIA]
$19.4056$	$17.8816$	[Table IIIB]
$0.009652$	$0.009652$	[Table IIIC]
$44.815252$ mm	$43.291252$ mm	

By Rule 3 — For tolerance of  $0.06$  in,  
 Fineness of rounding =  $0.01$  mm [Table II]

By Rule 4 — Thus the converted limits of size are:

$44.82$  and  $43.29$  mm

By Rule 5(b) — If desired, proceed further:

Converted tolerance  $44.82 - 43.29 = 1.53$  mm

∴ Tolerance limit =  $(1.53 - 0.01) \times 0.5 = 0.76$  mm

and Design dimension =  $\frac{44.82 + 43.29}{2}$

=  $44.055$  or  $44.06$  mm

∴ The converted size may, if desired, be specified as:

$44.06 \pm 0.76$  mm

NOTE — The lower converted limit obtained from this last statement is  $43.30$  which differs by  $0.01$  mm from the limit  $43.29$  obtained directly above. This discrepancy is unavoidable, but will cause no difficulty in practice so far as production, inspection and functional interchangeability are concerned (see also last sentence of 0.4).

#### Example 3

Convert into inches  $117.5 \pm 0.05$  mm.

By Rule 1 —

$117.55$  mm  $117.50$  mm

By Rule 2 —

$4.606299$	$4.606299$	[Table IVA]
$0.021654$	$0.019685$	[Table IVB]
$4.627953$ in	$4.625984$ in	

By Rule 3 — Fineness for  $0.05$  mm is  $0.0001$  in [Table II]

By Rule 4 — Converted limits:

$4.6280$  and  $4.6260$  in

By Rule 5(a) — If desired, express converted size as  $4.6260 \pm 0.0020$  in

## 4.2 Positional Dimensions

4.2.0 Any simple features, such as holes, pins or slots, besides having their sizes toleranced in the normal way, may have their relative positions toleranced in either of the two ways as indicated under 2 and Fig 1. Their conversion shall be carried out by procedures outlined under 4.2.1 and 4.2.2.

### 4.2.1 Normal Bilateral Positional Tolerances

RULE 6 — When positional dimension is specified in terms of true positional dimension and a bilateral tolerance in the normal way, carry out the conversion in the same manner as for the simple feature dimensions according to Rules 1 to 5, except that in this case application of Rule 5 shall be obligatory.

Note — There is nothing against specifying positional tolerance in a unilateral manner, but this is not normal practice. In case it does occur, it may be handled for conversion in the same manner as a bilateral positional tolerance.

#### Example 4

Convert into millimetres the positional dimensions of Fig 2.

By Rule 6 —

$1.00 \pm 0.02$ in	
$1.02$ in	$0.98$ in
25.4	—
0.508 0	24.892 0
25.908 0 mm	24.892 0 mm

[Table IIIA]  
[Table IIIB]

$3.50 \pm 0.02$ in	
$3.52$ in	$3.48$ in
76.2	76.2
13.208 0	12.192 0
89.408 0 mm	88.392 0 mm

[Table IIIA]  
[Table IIIB]

For tolerance of 0.04 in, fineness of rounding from Table II is 0.01 mm.

● Therefore, the converted limits are:

25.91 and 24.89 mm  
and 89.41 and 88.39 mm

Expressed as a positional dimension in the normal manner, the converted dimensions will be:

$25.40 \pm 0.51$  mm  
and  $88.90 \pm 0.51$  mm

#### 4.2.2 Geometrical Positional Tolerances

**RULE 7** — When positional dimension is defined in terms of true (or design) positional dimension and a geometrical tolerance, carry out the conversion separately for the true positional dimension and the geometrical tolerance, using the appropriate tables as under Rule 2; then round them off by using the fineness of rounding appropriate to the given (geometrical) tolerance, found from Table II as under Rule 3.

##### Example 5

Convert into millimetres the positional dimension of Fig 3.

By Rule 7—

$0.000\ 6$ in	$2.402\ 7$ in	
—	50.8	[Table IIIA]
—	10.210 8	[Table IIIB]
0.015 240	0.017 780	[Table IIIC]
0.015 240 mm	61.028 580 mm	

From Table II, fineness of rounding for a tolerance of 0.000 6 in is 0.001 mm. Thus the converted dimensions will be:

61.029 mm with a Positional Tolerance of 0.015 mm.

### 4.3 Datum Dimensions

**4.3.0** When converting datum dimensions, from one system of units to the other, care shall be exercised to ensure that error of conversion due to rounding off a theoretically exact dimension does not add to the error arising from the conversion of the associated toleranced dimensions. By following the procedure outlined in Rules 8 to 11 below, accumulation of such errors will be avoided.

#### 4.3.1 Rules for Datum Dimensions

**RULE 8** — Convert the theoretically exact datum dimension as under Rule 2 and round off this converted dimension to four places of decimal in inches and three places of decimal in millimetres.

**RULE 9** — Assuming the rounded value to be exact, take the difference between it and the unrounded value.

**RULE 10** — Consider the adjustment that the above-noted difference, will require to be made in the limits of the associated toleranced dimensions, if full account of it were to be taken. Wherever necessary, calculate the exact amount of variation that it will cause in the associated toleranced dimension(s).

**Note** — When a datum dimension locates a datum plane, as in Fig 4, the equivalent diameter or width variation of the tapered feature is found by multiplying the difference (noted under Rule 9) by the rate of taper. When the datum dimension is the diameter or width of the tapered feature, as in Fig 5, the equivalent length variation is found by dividing the difference (noted under Rule 9) by the rate of taper.

**RULE 11** — Convert the associated toleranced dimension(s), using the procedure outlined under Rules 1 to 5 but before rounding off the converted values, make appropriate adjustments to allow for the variation found under Rule 10.

##### Example 6

Convert the dimensions of Fig 4 into millimetres.

By Rule 8 — Datum plane dimension:

$0.875$  in  
 $22.225\ 0$  mm [Table IIIB]

Round to 22.225 mm

By Rule 9 — Difference is nil.

By Rule 10 — No adjustment is necessary.

By Rule 11 —

$1.250 - 0.002$  in  
 $1.250$  in  $1.248$  in  
25.4 25.4 [Tables IIIA  
6.350 0 6.299 2 and IIIB]  
31.750 0 mm 31.699 2 mm

Fineness of rounding for a tolerance of 0.002 in being 0.001 mm (Table II), the above values may be rounded to 31.750 and 31.699 mm.

##### Example 7

Convert the dimensions of Fig 5 into millimetres.

By Rule 8 — Datum diameter dimension:

$1.187\ 5$  in  
25.4 25.4 [Tables IIIA,  
4.749 8 IIIB and  
0.012 70 IIIC]  
30.162 50 mm  
Round to 30.162 mm

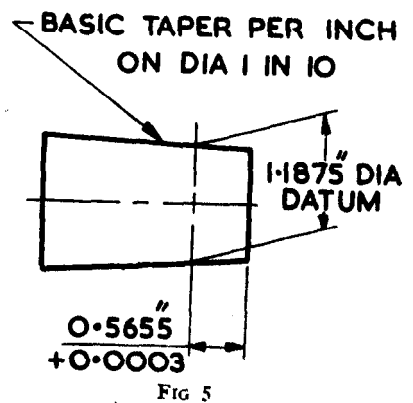
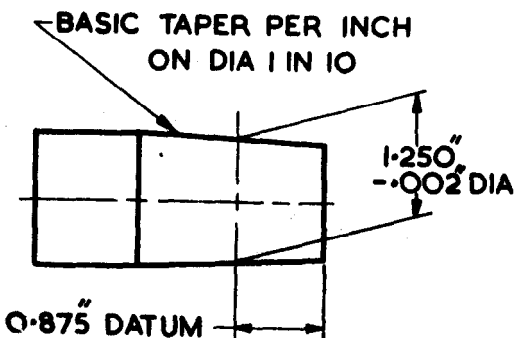
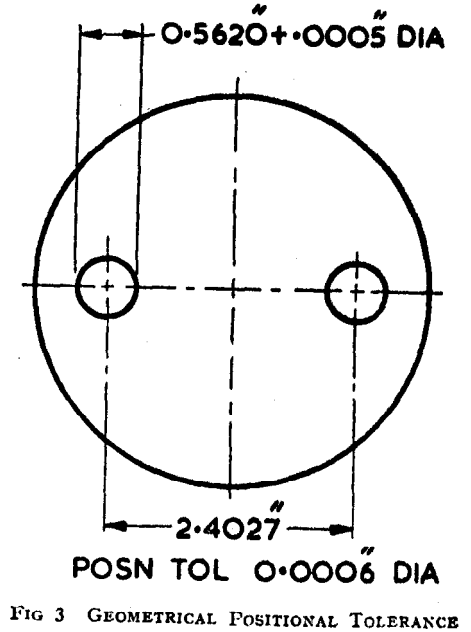
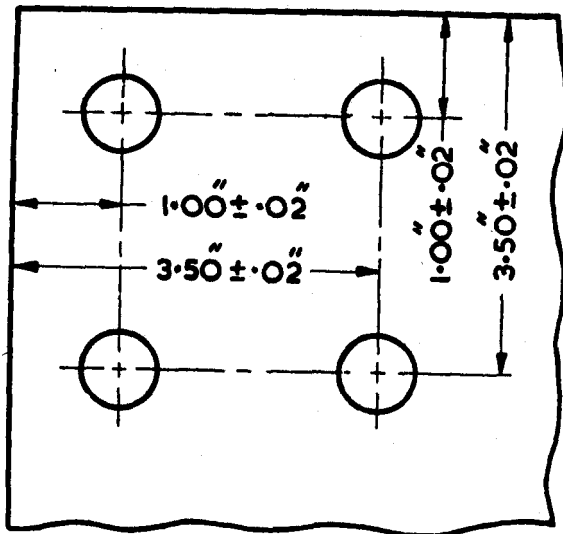
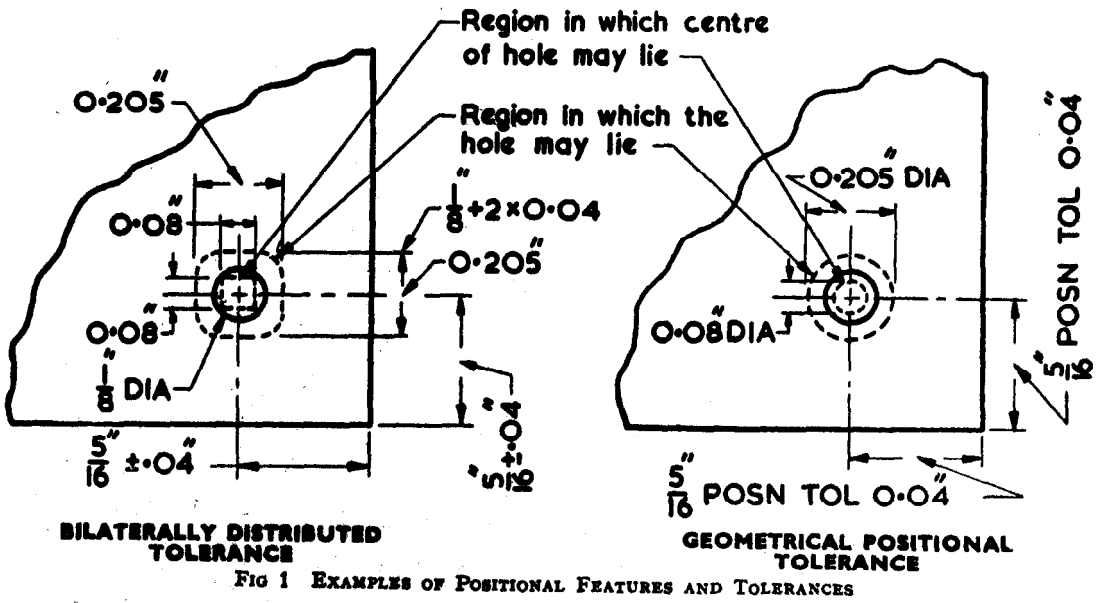


FIG 4 AND 5 EXAMPLES OF DATUM DIMENSIONS

By Rule 9 — Difference = 0.000 50 mm.

By Rule 10 — The rounded value being smaller than the unrounded, the difference will have the effect of moving the datum diameter towards the smaller end of the taper and thus reducing the tolerated length dimension by an amount:

$$0.000\ 50 \times 10 = 0.005\ 0\ \text{mm}$$

By Rule 11 —

0.565 5	+	0.000 3	in	
0.565 8		0.565 5	in	
14.351 0		mm	mm	[Tables IIIB and IIIC]
0.020 32		0.012 70	mm	
14.371 32		mm	mm	
-0.005 0		-0.005 0	mm	[By Rule 10,
14.366 32		mm	mm	see above]

Fineness of rounding for a tolerance of 0.000 3 in. being 0.001 mm (Table II), the above values may be rounded to:

14.366 and 14.359 mm

NOTE — It may be noted that the adjusted limits in the present case are appreciably smaller than the unadjusted limits. In a tolerance of 0.007 mm (14.366 — 14.359 mm), an adjustment of 0.005 mm is quite significant and could not possibly be ignored in the class of precision involved.

#### 4.4 Untoleranced Dimensions

4.4.0 In this category may be included all dimensions specified without any tolerance, either explicitly stated or implied. Implication of a tolerance may arise under various circumstances:

- a) A covering note on a drawing sometimes specifies tolerances applicable to all untoleranced dimensions appearing in the drawing.
- b) A code of practice for engineering drawings sometimes indicates the tolerances that may be ascribed to untoleranced dimensions appearing on drawings prepared in accordance with the particular code, which may or may not carry a tolerance note (see 13.2 of IS : 696-1955\*).
- c) Prevailing shop-practice in certain cases may demand certain limits of accuracy to be maintained when working to untoleranced dimensions of a drawing.
- d) Requirement of mating with other parts may at times necessitate a certain tolerance to be maintained in respect of an untoleranced dimension.

Maximum and minimum dimensions are usually stated without an indication of the accuracy required. In accordance with the Indian Standard practice, however, it would be necessary to state such dimensions to adequate number of places of decimal to indicate their accuracy. For example, 1.5 in maximum would mean an implied accuracy of  $\pm 0.05$  in; and 1.50 in minimum an accuracy of  $-0.005$  in.

All these and other aspects of untoleranced dimensions are discussed in some detail in IS : 787-1956, which is recommended if further study is desired. For the purpose of this standard, the

following rules are given for guidance, but a certain amount of discretion in their application will be found helpful.

##### 4.4.1 Rules for Untoleranced Dimensions

**RULE 12**—Consider the untoleranced dimension in all its contexts to find if any degree of accuracy is implied or required for mating or for other purpose. If so, ascribe to the given dimension the appropriate tolerance and convert it in accordance with the relevant rules from among Rules 1 to 11. In stating the result, simply give the rounded value without a tolerance.

**RULE 13**—If as a result of examination under Rule 12, the context gives no clue as to the possible or probable accuracy of the given dimension, then ascribe to it an accuracy of  $\pm 0.5$  unit in the last place of decimal as given in the original dimension, that is, a tolerance equal to one unit in the last given place of decimal. In certain cases, it may be obviously desirable to add an additional decimal place or two to the given dimension in which case it may be done consistent with the ascribed accuracy of  $\pm 0.5$  unit in the last place. In case the given dimension is in the form of a vulgar fraction convert it first of all to decimal notation rounding it off to retain as many places of decimal as may be consistent with the ascribed accuracy of  $\pm 0.5$  unit in the last place of decimal retained. Having rewritten the given dimension on the above basis proceed to convert as under Rules 1 to 11 and express the rounded result without a tolerance.

*Example 8*—Convert into millimetres a  $45^\circ$  chamfer of  $\frac{1}{8}$  in, which, according to the drawing, is to clear a 0.1 in radius on the mating component.

By Rule 12—A cursory examination of the problem indicates that it would suffice to express the given chamfer as  $\frac{1}{8} = 0.125$  or 0.12 in, ascribing a tolerance of  $\pm 0.005$  in, since the radius to be cleared may itself be expected to be no more accurate than 0.1, i.e.  $0.1 \pm 0.05$  in.

Thus

$$0.12\ \text{in} = 3.048\ \text{mm}.$$

From Table II, fineness of rounding for a tolerance of 0.01 in is 0.01 mm.

Thus

$$0.12\ \text{in} = 3.05\ \text{mm}.$$

Similarly, converting the radius, we get

$$0.1\ \text{in} = 2.54\ \text{mm} = 2.5\ \text{mm}.$$

*Example 9*—Convert the height of a lathe bed 3 ft 4 in to millimetres.

By Rule 13 —

$$\begin{aligned} 3\ \text{ft}\ 4\ \text{in} &= 40\ \text{in} \\ &= 40 \pm 0.5\ \text{in} \\ &= 1\ 016.0 \pm 12.7\ \text{mm} \\ &= 1\ 000\ \text{mm} \end{aligned}$$

\*Since revised.

**NOTE** — It will be seen that coarse tolerances of the order of 1 in. and above are not covered by Table II, nor is it necessary to cover them. Simple conversion of a large tolerance from inches to millimetres, and applying it with discretion to the converted value to obtain a reasonably workable answer is all that is necessary, especially in cases of the type illustrated in Example 9. In this example, it would, for instance, be meaningless to round off the lathe bed height to any other value but the nearest round figure of 1 000 mm. A few millimetres above or below the round figure may have been important if the lathe height were to match some other component or machine. In the absence of any such information, and in view of the large variation of height of lathe workers, a round figure in metric units should naturally be preferred. Thus it is clear that a great deal of discretion comes into play in dealing with such problems, which are after all of secondary importance so far as interchangeability of machine parts is concerned. But untoleranced conversion problems connected with the establishment of new standards and new practices require careful individual study by responsible engineers and organizations. Therefore, the draftsman and the designer will be well advised in such cases to consult the decision-making authority concerned.

## 4.5 Standard Feature Dimensions

**4.5.0** Conversion of dimensions of standard features as defined under 2.1.1 has been dealt with in some detail in IS : 787-1956 under Dimensional Designations, which may either be standardized or non-standard. It has been recommended in that standard that the former need not be converted, while the latter should be converted according to rules. For a closer study, reference is invited to IS : 787-1956.

For the purpose of this standard, it should suffice to point out that standard feature dimensions given in inches can only be converted when features of the same approximate size have been standardized in metric units and the actual standard machine parts to which these features pertain become generally available for use. Also, as a corollary, small tools required for the production of the parts should be available. In the meantime, there need be no objection to continue to use the inch-based standard parts and inch-based standard tools required to machine the standard features in question. It should, however, be noted that the standard features which are converted will not be dimensionally interchangeable with the original features.

An example will make the meaning clear. A drawing may require the use of a  $\frac{3}{8}$  in Whitworth bolt to fit into a tapped hole. Conversion of  $\frac{3}{8}$  in dimension to millimetre, or for that matter the conversion of detailed dimensions of the screw thread on a  $\frac{3}{8}$  in bolt, would be futile and unnecessary, because the bolt of the required size can only be bought in the market when it is specified in terms of its inch dimensions. Nor is it practical to convert the dimensions of the screw thread in the tapped hole, for it has not only to mate with the  $\frac{3}{8}$  in bolt but also requires an appropriate tap to cut it and this tap cannot be specified in millimetre dimensions. Thus, until standards on metric threads, together with standards for

metric bolts, nuts and the related tools become available, it would not be desirable to convert the dimensions of inch-based screw threads, though the depths of tapped holes may be converted. Whether the length of a bolt or the thickness of a nut is to be converted or not will depend upon whether it is to be specially produced or bought ready-made as a standard part. On the other hand, when the metric standards for screw threads together with those for parts and tools do become available, then the  $\frac{3}{8}$  inch bolt should be promptly replaced by an appropriate bolt from the metric standard series. But the metric bolt will not be interchangeable with the  $\frac{3}{8}$  in bolt. Similar remarks apply to gear teeth for gears and splines for splined shafts where standard gears, splines and their cutters are involved. Wires, sheets, I-beams, angles, etc, present the same picture. Thus the rules to be followed are given as follows.

### 4.5.1 Rules for Standard Feature Dimensions

**RULE 14** — Standard feature dimensions shall not be converted unless standards based on the new set of units are available, in which case follow Rule 15. When unconverted standard feature dimensions are retained on a drawing which has otherwise been generally converted to a new set of units, such dimensions shall be enclosed in a rectangle.

**RULE 15** — When alternate standards based on the system of units to which standard feature dimensions are required to be converted are available, these features shall be replaced by features of the appropriate size selected from the relevant standards, and all the associated dimensions affected, by this choice shall be appropriately adjusted.

**Example 10** — By way of example, it would be useful to list some of the standard features which, in the Indian context of 1957, need not be converted immediately to metric sizes (Rule 14), but as and when Indian Standards for such features and for materials, parts and tools based on such features become available, they may be replaced by the appropriately selected metric features from among those covered by the new Indian Standards (Rule 15) Such a list is given below:

- a) Screw Threads
- b) Gear Teeth
- c) Involute Splines (Straight splines may be converted)
- d) Sheet and Wire Gauges
- e) Standard Rolled Sections of Metals Including Structural Steel Sections

It is obvious that from time to time certain of the above items will be removed from the purview of Rule 14 and come under Rule 15. If the Union Parliament Act on Standards of Weights and Measures were strictly interpreted, all such items should come under Rule 15 within ten years of its adoption, that is, by December 1966.

TABLE IIIA INCHES TO MILLIMETRES (EXACT)

Range: 1 to 100 in

Clauses 3.4 and 4.1)

Inches→ ↓	0	1	2	3	4	5	6	7	8	9
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
0	0	25.4	50.8	76.2	101.6	127.0	152.4	177.8	203.2	228.6
10	254.0	279.4	304.8	330.2	355.6	381.0	406.4	431.8	457.2	482.6
20	508.0	533.4	558.8	584.2	609.6	635.0	660.4	685.8	711.2	736.6
30	762.0	787.4	812.8	838.2	863.6	889.0	914.4	939.8	965.2	990.6
40	1 016.0	1 041.4	1 066.8	1 092.2	1 117.6	1 143.0	1 168.4	1 193.8	1 219.2	1 244.6
50	1 270.0	1 295.4	1 320.8	1 346.2	1 371.6	1 397.0	1 422.4	1 447.8	1 473.2	1 498.6
60	1 524.0	1 549.4	1 574.8	1 600.2	1 625.6	1 651.0	1 676.4	1 701.8	1 727.2	1 752.6
70	1 778.0	1 803.4	1 828.8	1 854.2	1 879.6	1 905.0	1 930.4	1 955.8	1 981.2	2 006.6
80	2 032.0	2 057.4	2 082.8	2 108.2	2 133.6	2 159.0	2 184.4	2 209.8	2 235.2	2 260.6
90	2 286.0	2 311.4	2 336.8	2 362.2	2 387.6	2 413.0	2 438.4	2 463.8	2 489.2	2 514.6
100	2 540.0									

TABLE IIIB INCHES TO MILLIMETRES (EXACT)

Range: 0.001 to 1.000 in

(Clauses 3.4 and 4.1)

Inches→ ↓	0	0.001	0.002	0.003	0.004	0.005	0.006	0.007	0.008	0.009
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
0	0	0.025 4	0.050 8	0.076 2	0.101 6	0.127 0	0.152 4	0.177 8	0.203 2	0.228 6
0.01	0.254 0	0.279 4	0.304 8	0.330 2	0.355 6	0.381 0	0.406 4	0.431 8	0.457 2	0.482 6
0.02	0.508 0	0.533 4	0.558 8	0.584 2	0.609 6	0.635 0	0.660 4	0.685 8	0.711 2	0.736 6
0.03	0.762 0	0.787 4	0.812 8	0.838 2	0.863 6	0.889 0	0.914 4	0.939 8	0.965 2	0.990 6
0.04	1.016 0	1.041 4	1.066 8	1.092 2	1.117 6	1.143 0	1.168 4	1.193 8	1.219 2	1.244 6
0.05	1.270 0	1.295 4	1.320 8	1.346 2	1.371 6	1.397 0	1.422 4	1.447 8	1.473 2	1.498 6
0.06	1.524 0	1.549 4	1.574 8	1.600 2	1.625 6	1.651 0	1.676 4	1.701 8	1.727 2	1.752 6
0.07	1.778 0	1.803 4	1.828 8	1.854 2	1.879 6	1.905 0	1.930 4	1.955 8	1.981 2	2.006 6
0.08	2.032 0	2.057 4	2.082 8	2.108 2	2.133 6	2.159 0	2.184 4	2.209 8	2.235 2	2.260 6
0.09	2.286 0	2.311 4	2.336 8	2.362 2	2.387 6	2.413 0	2.438 4	2.463 8	2.489 2	2.514 6
0.10	2.540 0	2.565 4	2.590 8	2.616 2	2.641 6	2.667 0	2.692 4	2.717 8	2.743 2	2.768 6
0.11	2.794 0	2.819 4	2.844 8	2.870 2	2.895 6	2.921 0	2.946 4	2.971 8	2.997 2	3.022 6
0.12	3.048 0	3.073 4	3.098 8	3.124 2	3.149 6	3.175 0	3.200 4	3.225 8	3.251 2	3.276 6
0.13	3.302 0	3.327 4	3.352 8	3.378 2	3.403 6	3.429 0	3.454 4	3.479 8	3.505 2	3.530 6
0.14	3.556 0	3.581 4	3.606 8	3.632 2	3.657 6	3.683 0	3.708 4	3.733 8	3.759 2	3.784 6
0.15	3.810 0	3.835 4	3.860 8	3.886 2	3.911 6	3.937 0	3.962 4	3.987 8	4.013 2	4.038 6
0.16	4.064 0	4.089 4	4.114 8	4.140 2	4.165 6	4.191 0	4.216 4	4.241 8	4.267 2	4.292 6
0.17	4.318 0	4.343 4	4.368 8	4.394 2	4.419 6	4.445 0	4.470 4	4.495 8	4.521 2	4.546 6
0.18	4.572 0	4.597 4	4.622 8	4.648 2	4.673 6	4.699 0	4.724 4	4.749 8	4.775 2	4.800 6
0.19	4.826 0	4.851 4	4.876 8	4.902 2	4.927 6	4.953 0	4.978 4	5.003 8	5.029 2	5.054 6
0.20	5.080 0	5.105 4	5.130 8	5.156 2	5.181 6	5.207 0	5.232 4	5.257 8	5.283 2	5.308 6
0.21	5.334 0	5.359 4	5.384 8	5.410 2	5.435 6	5.461 0	5.486 4	5.511 8	5.537 2	5.562 6
0.22	5.588 0	5.613 4	5.638 8	5.664 2	5.689 6	5.715 0	5.740 4	5.765 8	5.791 2	5.816 6
0.23	5.842 0	5.867 4	5.892 8	5.918 2	5.943 6	5.969 0	5.994 4	6.019 8	6.045 2	6.070 6
0.24	6.096 0	6.121 4	6.146 8	6.172 2	6.197 6	6.223 0	6.248 4	6.273 8	6.299 2	6.324 6



TABLE IIIB INCHES TO MILLIMETRES (EXACT) — *Contd*

Range : 0.001 to 1.000 in

Inches → ↓	0	0.001	0.002	0.003	0.004	0.005	0.006	0.007	0.008	0.009
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
0.25	6.350 0	6.375 4	6.400 8	6.426 2	6.451 6	6.477 0	6.502 4	6.527 8	6.553 2	6.578 6
0.26	6.604 0	6.629 4	6.654 8	6.680 2	6.705 6	6.731 0	6.756 4	6.781 8	6.807 2	6.832 6
0.27	6.858 0	6.883 4	6.908 8	6.934 2	6.959 6	6.985 0	7.010 4	7.035 8	7.061 2	7.086 6
0.28	7.112 0	7.137 4	7.162 8	7.188 2	7.213 6	7.239 0	7.264 4	7.289 8	7.315 2	7.340 6
0.29	7.366 0	7.391 4	7.416 8	7.442 2	7.467 6	7.493 0	7.518 4	7.543 8	7.569 2	7.594 6
0.30	7.620 0	7.645 4	7.670 8	7.696 2	7.721 6	7.747 0	7.772 4	7.797 8	7.823 2	7.848 6
0.31	7.874 0	7.899 4	7.924 8	7.950 2	7.975 6	8.001 0	8.026 4	8.051 8	8.077 2	8.102 6
0.32	8.128 0	8.153 4	8.178 8	8.204 2	8.229 6	8.255 0	8.280 4	8.305 8	8.331 2	8.356 6
0.33	8.382 0	8.407 4	8.432 8	8.458 2	8.483 6	8.509 0	8.534 4	8.559 8	8.585 2	8.610 6
0.34	8.636 0	8.661 4	8.686 8	8.712 2	8.737 6	8.763 0	8.788 4	8.813 8	8.839 2	8.864 6
0.35	8.890 0	8.915 4	8.940 8	8.966 2	8.991 6	9.017 0	9.042 4	9.067 8	9.093 2	9.118 6
0.36	9.144 0	9.169 4	9.194 8	9.220 2	9.245 6	9.271 0	9.296 4	9.321 8	9.347 2	9.372 6
0.37	9.398 0	9.423 4	9.448 8	9.474 2	9.499 6	9.525 0	9.550 4	9.575 8	9.601 2	9.626 6
0.38	9.652 0	9.677 4	9.702 8	9.728 2	9.753 6	9.779 0	9.804 4	9.829 8	9.855 2	9.880 6
0.39	9.906 0	9.931 4	9.956 8	9.982 2	10.007 6	10.033 0	10.058 4	10.083 8	10.109 2	10.134 6
0.40	10.160 0	10.185 4	10.210 8	10.236 2	10.261 6	10.287 0	10.312 4	10.337 8	10.363 2	10.388 6
0.41	10.414 0	10.439 4	10.464 8	10.490 2	10.515 6	10.541 0	10.566 4	10.591 8	10.617 2	10.642 6
0.42	10.668 0	10.693 4	10.718 8	10.744 2	10.769 6	10.795 0	10.820 4	10.845 8	10.871 2	10.896 6
0.43	10.922 0	10.947 4	10.972 8	10.998 2	11.023 6	11.049 0	11.074 4	11.099 8	11.125 2	11.150 6
0.44	11.176 0	11.201 4	11.226 8	11.252 2	11.277 6	11.303 0	11.328 4	11.353 8	11.379 2	11.404 6
0.45	11.430 0	11.455 4	11.480 8	11.506 2	11.531 6	11.557 0	11.582 4	11.607 8	11.633 2	11.658 6
0.46	11.684 0	11.709 4	11.734 8	11.760 2	11.785 6	11.811 0	11.836 4	11.861 8	11.887 2	11.912 6
0.47	11.938 0	11.963 4	11.988 8	12.014 2	12.039 6	12.065 0	12.090 4	12.115 8	12.141 2	12.166 6
0.48	12.192 0	12.217 4	12.242 8	12.268 2	12.293 6	12.319 0	12.344 4	12.369 8	12.395 2	12.420 6
0.49	12.446 0	12.471 4	12.496 8	12.522 2	12.547 6	12.573 0	12.598 4	12.623 8	12.649 2	12.674 6

TABLE IIIB INCHES TO MILLIMETRES (EXACT) — *Contd*

Range: 0.001 to 1.000 in

Inches→ ↓	0	0.001	0.002	0.003	0.004	0.005	0.006	0.007	0.008	0.009
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
0.50	12.700 0	12.725 4	12.750 8	12.776 2	12.801 6	12.827 0	12.852 4	12.877 8	12.903 2	12.928 6
0.51	12.954 0	12.979 4	13.004 8	13.030 2	13.055 6	13.081 0	13.106 4	13.131 8	13.157 2	13.182 6
0.52	13.208 0	13.233 4	13.258 8	13.284 2	13.309 6	13.335 0	13.360 4	13.385 8	13.411 2	13.436 6
0.53	13.462 0	13.487 4	13.512 8	13.538 2	13.563 6	13.589 0	13.614 4	13.639 8	13.665 2	13.690 6
0.54	13.716 0	13.741 4	13.766 8	13.792 2	13.817 6	13.843 0	13.868 4	13.893 8	13.919 2	13.944 6
0.55	13.970 0	13.995 4	14.020 8	14.046 2	14.071 6	14.097 0	14.122 4	14.147 8	14.173 2	14.198 6
0.56	14.224 0	14.249 4	14.274 8	14.300 2	14.325 6	14.351 0	14.376 4	14.401 8	14.427 2	14.452 6
0.57	14.478 0	14.503 4	14.528 8	14.554 2	14.579 6	14.605 0	14.630 4	14.655 8	14.681 2	14.706 6
0.58	14.732 0	14.757 4	14.782 8	14.808 2	14.833 6	14.859 0	14.884 4	14.909 8	14.935 2	14.960 6
0.59	14.986 0	15.011 4	15.036 8	15.062 2	15.087 6	15.113 0	15.138 4	15.163 8	15.189 2	15.214 6
0.60	15.240 0	15.265 4	15.290 8	15.316 2	15.341 6	15.367 0	15.392 4	15.417 8	15.443 2	15.468 6
0.61	15.494 0	15.519 4	15.544 8	15.570 2	15.595 6	15.621 0	15.646 4	15.671 8	15.697 2	15.722 6
0.62	15.748 0	15.773 4	15.798 8	15.824 2	15.849 6	15.875 0	15.900 4	15.925 8	15.951 2	15.976 6
0.63	16.002 0	16.027 4	16.052 8	16.078 2	16.103 6	16.129 0	16.154 4	16.179 8	16.205 2	16.230 6
0.64	16.256 0	16.281 4	16.306 8	16.332 2	16.357 6	16.383 0	16.408 4	16.433 8	16.459 2	16.484 6
0.65	16.510 0	16.535 4	16.560 8	16.586 2	16.611 6	16.637 0	16.662 4	16.687 8	16.713 2	16.738 6
0.66	16.764 0	16.789 4	16.814 8	16.840 2	16.865 6	16.891 0	16.916 4	16.941 8	16.967 2	16.992 6
0.67	17.018 0	17.043 4	17.068 8	17.094 2	17.119 6	17.145 0	17.170 4	17.195 8	17.221 2	17.246 6
0.68	17.272 0	17.297 4	17.322 8	17.348 2	17.373 6	17.399 0	17.424 4	17.449 8	17.475 2	17.500 6
0.69	17.526 0	17.551 4	17.576 8	17.602 2	17.627 6	17.653 0	17.678 4	17.703 8	17.729 2	17.754 6
0.70	17.780 0	17.805 4	17.830 8	17.856 2	17.881 6	17.907 0	17.932 4	17.957 8	17.983 2	18.008 6
0.71	18.034 0	18.059 4	18.084 8	18.110 2	18.135 6	18.161 0	18.186 4	18.211 8	18.237 2	18.262 6
0.72	18.288 0	18.313 4	18.338 8	18.364 2	18.389 6	18.415 0	18.440 4	18.465 8	18.491 2	18.516 6
0.73	18.542 0	18.567 4	18.592 8	18.618 2	18.643 6	18.669 0	18.694 4	18.719 8	18.745 2	18.770 6
0.74	18.796 0	18.821 4	18.846 8	18.872 2	18.897 6	18.923 0	18.948 4	18.973 8	18.999 2	19.024 6

TABLE IIIB INCHES TO MILLIMETRES (EXACT) — *Contd*

Range: 0.001 to 1.000 in

Inches→ ↓	0	0.001	0.002	0.003	0.004	0.005	0.006	0.007	0.008	0.009
	mm	mm	mm	mm	mm	mm	mm	mm	mm	mm
<b>0.75</b>	19.050 0	19.075 4	19.100 8	19.126 2	19.151 6	19.177 0	<b>19.202 4</b>	<b>19.227 8</b>	<b>19.253 2</b>	<b>19.278 6</b>
<b>0.76</b>	19.304 0	19.329 4	19.354 8	19.380 2	19.405 6	19.431 0	<b>19.456 4</b>	<b>19.481 8</b>	<b>19.507 2</b>	<b>19.532 6</b>
<b>0.77</b>	19.558 0	19.583 4	19.608 8	19.634 2	19.659 6	19.685 0	<b>19.710 4</b>	<b>19.735 8</b>	<b>19.761 2</b>	<b>19.786 6</b>
<b>0.78</b>	19.812 0	19.837 4	19.862 8	19.888 2	19.913 6	19.939 0	<b>19.964 4</b>	<b>19.989 8</b>	<b>20.015 2</b>	<b>20.040 6</b>
<b>0.79</b>	20.066 0	20.091 4	20.116 8	20.142 2	20.167 6	20.193 0	<b>20.218 4</b>	<b>20.243 8</b>	<b>20.269 2</b>	<b>20.294 6</b>
<b>0.80</b>	20.320 0	20.345 4	20.370 8	20.396 2	20.421 6	20.447 0	<b>20.472 4</b>	<b>20.497 8</b>	<b>20.523 2</b>	<b>20.548 6</b>
<b>0.81</b>	20.574 0	20.599 4	20.624 8	20.650 2	20.675 6	20.701 0	<b>20.726 4</b>	<b>20.751 8</b>	<b>20.777 2</b>	<b>20.802 6</b>
<b>0.82</b>	20.828 0	20.853 4	20.878 8	20.904 2	20.929 6	20.955 0	<b>20.980 4</b>	<b>21.005 8</b>	<b>21.031 2</b>	<b>21.056 6</b>
<b>0.83</b>	21.082 0	21.107 4	21.132 8	21.158 2	21.183 6	21.209 0	<b>21.234 4</b>	<b>21.259 8</b>	<b>21.285 2</b>	<b>21.310 6</b>
<b>0.84</b>	21.336 0	21.361 4	21.386 8	21.412 2	21.437 6	21.463 0	<b>21.488 4</b>	<b>21.513 8</b>	<b>21.539 2</b>	<b>21.564 6</b>
<b>0.85</b>	21.590 0	21.615 4	21.640 8	21.666 2	21.691 6	21.717 0	<b>21.742 4</b>	<b>21.767 8</b>	<b>21.793 2</b>	<b>21.818 6</b>
<b>0.86</b>	21.844 0	21.869 4	21.894 8	21.920 2	21.945 6	21.971 0	<b>21.996 4</b>	<b>22.021 8</b>	<b>22.047 2</b>	<b>22.072 6</b>
<b>0.87</b>	22.098 0	22.123 4	22.148 8	22.174 2	22.199 6	22.225 0	<b>22.250 4</b>	<b>22.275 8</b>	<b>22.301 2</b>	<b>22.326 6</b>
<b>0.88</b>	22.352 0	22.377 4	22.402 8	22.428 2	22.453 6	22.479 0	<b>22.504 4</b>	<b>22.529 8</b>	<b>22.555 2</b>	<b>22.580 6</b>
<b>0.89</b>	22.606 0	22.631 4	22.656 8	22.682 2	22.707 6	22.733 0	<b>22.758 4</b>	<b>22.783 8</b>	<b>22.809 2</b>	<b>22.834 6</b>
<b>0.90</b>	22.860 0	22.885 4	22.910 8	22.936 2	22.961 6	22.987 0	<b>23.012 4</b>	<b>23.037 8</b>	<b>23.063 2</b>	<b>23.088 6</b>
<b>0.91</b>	23.114 0	23.139 4	23.164 8	23.190 2	23.215 6	23.241 0	<b>23.266 4</b>	<b>23.291 8</b>	<b>23.317 2</b>	<b>23.342 6</b>
<b>0.92</b>	23.368 0	23.393 4	23.418 8	23.444 2	23.469 6	23.495 0	<b>23.520 4</b>	<b>23.545 8</b>	<b>23.571 2</b>	<b>23.596 6</b>
<b>0.93</b>	23.622 0	23.647 4	23.672 8	23.698 2	23.723 6	23.749 0	<b>23.774 4</b>	<b>23.799 8</b>	<b>23.825 2</b>	<b>23.850 6</b>
<b>0.94</b>	23.876 0	23.901 4	23.926 8	23.952 2	23.977 6	24.003 0	<b>24.028 4</b>	<b>24.053 8</b>	<b>24.079 2</b>	<b>24.104 6</b>
<b>0.95</b>	24.130 0	24.155 4	24.180 8	24.206 2	24.231 6	24.257 0	<b>24.282 4</b>	<b>24.307 8</b>	<b>24.333 2</b>	<b>24.358 6</b>
<b>0.96</b>	24.384 0	24.409 4	24.434 8	24.460 2	24.485 6	24.511 0	<b>24.536 4</b>	<b>24.561 8</b>	<b>24.587 2</b>	<b>24.612 6</b>
<b>0.97</b>	24.638 0	24.663 4	24.688 8	24.714 2	24.739 6	24.765 0	<b>24.790 4</b>	<b>24.815 8</b>	<b>24.841 2</b>	<b>24.866 6</b>
<b>0.98</b>	24.892 0	24.917 4	24.942 8	24.968 2	24.993 6	25.019 0	<b>25.044 4</b>	<b>25.069 8</b>	<b>25.095 2</b>	<b>25.120 6</b>
<b>0.99</b>	25.146 0	25.171 4	25.196 8	25.222 2	25.247 6	25.273 0	<b>25.298 4</b>	<b>25.323 8</b>	<b>25.349 2</b>	<b>25.374 6</b>
<b>1.000</b>	25.400 0									

TABLE IIIC INCHES TO MILLIMETRES (EXACT)

Range: 0-000 01 to 0-001 00 in

(Clauses 3.4 and 4.1)

in	mm	in	mm
0-000 01	0-000 254	0-000 51	0-012 954
0-000 02	0-000 508	0-000 52	0-013 208
0-000 03	0-000 762	0-000 53	0-013 462
0-000 04	0-001 016	0-000 54	0-013 716
0-000 05	0-001 270	0-000 55	0-013 970
0-000 06	0-001 524	0-000 56	0-014 224
0-000 07	0-001 778	0-000 57	0-014 478
0-000 08	0-002 032	0-000 58	0-014 732
0-000 09	0-002 286	0-000 59	0-014 986
0-000 10	0-002 540	0-000 60	0-015 240
0-000 11	0-002 794	0-000 61	0-015 494
0-000 12	0-003 048	0-000 62	0-015 748
0-000 13	0-003 302	0-000 63	0-016 002
0-000 14	0-003 556	0-000 64	0-016 256
0-000 15	0-003 810	0-000 65	0-016 510
0-000 16	0-004 064	0-000 66	0-016 764
0-000 17	0-004 318	0-000 67	0-017 018
0-000 18	0-004 572	0-000 68	0-017 272
0-000 19	0-004 826	0-000 69	0-017 526
0-000 20	0-005 080	0-000 70	0-017 780
0-000 21	0-005 334	0-000 71	0-018 034
0-000 22	0-005 588	0-000 72	0-018 288
0-000 23	0-005 842	0-000 73	0-018 542
0-000 24	0-006 096	0-000 74	0-018 796
0-000 25	0-006 350	0-000 75	0-019 050
0-000 26	0-006 604	0-000 76	0-019 304
0-000 27	0-006 858	0-000 77	0-019 558
0-000 28	0-007 112	0-000 78	0-019 812
0-000 29	0-007 366	0-000 79	0-020 066
0-000 30	0-007 620	0-000 80	0-020 320
0-000 31	0-007 874	0-000 81	0-020 574
0-000 32	0-008 128	0-000 82	0-020 828
0-000 33	0-008 382	0-000 83	0-021 082
0-000 34	0-008 636	0-000 84	0-021 336
0-000 35	0-008 890	0-000 85	0-021 590
0-000 36	0-009 144	0-000 86	0-021 844
0-000 37	0-009 398	0-000 87	0-022 098
0-000 38	0-009 652	0-000 88	0-022 352
0-000 39	0-009 906	0-000 89	0-022 606
0-000 40	0-010 160	0-000 90	0-022 860
0-000 41	0-010 414	0-000 91	0-023 114
0-000 42	0-010 668	0-000 92	0-023 368
0-000 43	0-010 922	0-000 93	0-023 622
0-000 44	0-011 176	0-000 94	0-023 876
0-000 45	0-011 430	0-000 95	0-024 130
0-000 46	0-011 684	0-000 96	0-024 384
0-000 47	0-011 938	0-000 97	0-024 638
0-000 48	0-012 192	0-000 98	0-024 892
0-000 49	0-012 446	0-000 99	0-025 146
0-000 50	0-012 700	0-001 00	0-025 400

TABLE IIID COMMON FRACTIONS OF INCHES TO MILLIMETRES

Range:  $\frac{1}{16}$  to 1 in

(Clauses 3.4 and 4.1)

Inches	Decimal Inch	Millimetres	Inches	Decimal Inch	Millimetres
$\frac{1}{16}$	0.015 625	0.396 875	$\frac{1}{8}$	0.515 625	13.096 875
$\frac{1}{8}$	0.031 250	0.793 750	$\frac{3}{16}$	0.531 250	13.493 750
$\frac{3}{16}$	0.046 875	1.190 625	$\frac{1}{4}$	0.546 875	13.890 625
$\frac{1}{4}$	0.062 500	1.587 500	$\frac{5}{16}$	0.562 500	14.287 500
$\frac{5}{16}$	0.078 125	1.984 375	$\frac{3}{8}$	0.578 125	14.684 375
$\frac{3}{8}$	0.093 750	2.381 250	$\frac{7}{16}$	0.593 750	15.081 250
$\frac{1}{2}$	0.109 375	2.778 125	$\frac{1}{2}$	0.609 375	15.478 125
$\frac{5}{8}$	0.125 000	3.175 000	$\frac{9}{16}$	0.625 000	15.875 000
$\frac{3}{4}$	0.140 625	3.571 875	$\frac{1}{2}$	0.640 625	16.271 875
$\frac{7}{8}$	0.156 250	3.968 750	$\frac{5}{8}$	0.656 250	16.668 750
$\frac{15}{16}$	0.171 875	4.365 625	$\frac{3}{4}$	0.671 875	17.065 625
$\frac{1}{2}$	0.187 500	4.762 500	$\frac{7}{8}$	0.687 500	17.462 500
$\frac{5}{8}$	0.203 125	5.159 375	$\frac{15}{16}$	0.703 125	17.859 375
$\frac{3}{4}$	0.218 750	5.556 250	$\frac{1}{2}$	0.718 750	18.256 250
$\frac{7}{8}$	0.234 375	5.953 125	$\frac{11}{16}$	0.734 375	18.653 125
$\frac{15}{16}$	0.250 000	6.350 000	$\frac{1}{2}$	0.750 000	19.050 000
$\frac{1}{2}$	0.265 625	6.746 875	$\frac{5}{8}$	0.765 625	19.446 875
$\frac{3}{4}$	0.281 250	7.143 750	$\frac{3}{4}$	0.781 250	19.843 750
$\frac{7}{8}$	0.296 875	7.540 625	$\frac{11}{16}$	0.796 875	20.240 625
$\frac{15}{16}$	0.312 500	7.937 500	$\frac{3}{4}$	0.812 500	20.637 500
$\frac{1}{2}$	0.328 125	8.334 375	$\frac{7}{8}$	0.828 125	21.034 375
$\frac{3}{4}$	0.343 750	8.731 250	$\frac{15}{16}$	0.843 750	21.431 250
$\frac{7}{8}$	0.359 375	9.128 125	$\frac{1}{2}$	0.859 375	21.828 125
$\frac{15}{16}$	0.375 000	9.525 000	$\frac{1}{2}$	0.875 000	22.225 000
$\frac{1}{2}$	0.390 625	9.921 875	$\frac{5}{8}$	0.890 625	22.621 875
$\frac{3}{4}$	0.406 250	10.318 750	$\frac{3}{4}$	0.906 250	23.018 750
$\frac{7}{8}$	0.421 875	10.715 625	$\frac{11}{16}$	0.921 875	23.415 625
$\frac{15}{16}$	0.437 500	11.112 500	$\frac{3}{4}$	0.937 500	23.812 500
$\frac{1}{2}$	0.453 125	11.509 375	$\frac{7}{8}$	0.953 125	24.209 375
$\frac{3}{4}$	0.468 750	11.906 250	$\frac{15}{16}$	0.968 750	24.606 250
$\frac{7}{8}$	0.484 375	12.303 125	$\frac{1}{2}$	0.984 375	25.003 125
$\frac{15}{16}$	0.500 000	12.700 000	1	1.000 000	25.400 000

NOTE — All figures beyond the six places of decimals given are zeros.

TABLE IVA MILLIMETRES TO INCHES

Range: 1 to 1 000 mm

(Clauses 3.4 and 4.1)

Milli- metres→ ↓	0	1	2	3	4	5	6	7	8	9
	in	in	in	in	in	in	in	in	in	in
0	0	0-039 370	0-078 740	0-118 110	0-157 480	0-196 850	0-236 220	0-275 591	0-314 961	0-354 331
10	0-393 701	0-433 071	0-472 441	0-511 811	0-551 181	0-590 551	0-629 921	0-669 291	0-708 661	0-748 032
20	0-787 402	0-826 772	0-866 142	0-905 512	0-944 882	0-984 252	1-023 622	1-062 992	1-102 362	1-141 732
30	1-181 102	1-220 472	1-259 843	1-299 213	1-338 583	1-377 953	1-417 323	1-456 693	1-496 063	1-535 433
40	1-574 803	1-614 173	1-653 543	1-692 913	1-732 283	1-771 654	1-811 024	1-850 394	1-889 764	1-929 134
50	1-968 504	2-007 874	2-047 244	2-086 614	2-125 984	2-165 354	2-204 724	2-244 095	2-283 465	2-322 835
60	2-362 205	2-401 575	2-440 945	2-480 315	2-519 685	2-559 055	2-598 425	2-637 795	2-677 165	2-716 535
70	2-755 906	2-795 276	2-834 646	2-874 016	2-913 386	2-952 756	2-992 126	3-031 496	3-070 866	3-110 236
80	3-149 606	3-188 976	3-228 346	3-267 717	3-307 087	3-346 457	3-385 827	3-425 197	3-464 567	3-503 937
90	3-543 307	3-582 677	3-622 047	3-661 417	3-700 787	3-740 158	3-779 528	3-818 898	3-858 268	3-897 638
100	3-937 008	3-976 378	4-015 748	4-055 118	4-094 488	4-133 858	4-173 228	4-212 598	4-251 969	4-291 339
110	4-330 709	4-370 079	4-409 449	4-448 819	4-488 189	4-527 559	4-566 929	4-606 299	4-645 669	4-685 039
120	4-724 409	4-763 780	4-803 150	4-842 520	4-881 890	4-921 260	4-960 630	5-000 000	5-039 370	5-078 740
130	5-118 110	5-157 480	5-196 850	5-236 220	5-275 591	5-314 961	5-354 331	5-393 701	5-433 071	5-472 441
140	5-511 811	5-551 181	5-590 551	5-629 921	5-669 291	5-708 661	5-748 032	5-787 402	5-826 772	5-866 142
150	5-905 512	5-944 882	5-984 252	6-023 622	6-062 992	6-102 362	6-141 732	6-181 102	6-220 472	6-259 842
160	6-299 213	6-338 583	6-377 953	6-417 323	6-456 693	6-496 063	6-535 433	6-574 803	6-614 173	6-653 543
170	6-692 913	6-732 284	6-771 654	6-811 024	6-850 394	6-889 764	6-929 134	6-968 504	7-007 874	7-047 244
180	7-086 614	7-125 984	7-165 354	7-204 724	7-244 094	7-283 465	7-322 835	7-362 205	7-401 575	7-440 945
190	7-480 315	7-519 685	7-559 055	7-598 425	7-637 795	7-677 165	7-716 535	7-755 906	7-795 276	7-834 646
200	7-874 016	7-913 386	7-952 756	7-992 126	8-031 496	8-070 866	8-110 236	8-149 606	8-188 976	8-228 346
210	8-267 716	8-307 087	8-346 457	8-385 827	8-425 197	8-464 567	8-503 937	8-543 307	8-582 677	8-622 047
220	8-661 417	8-700 787	8-740 158	8-779 528	8-818 898	8-858 268	8-897 638	8-937 008	8-976 378	9-015 748
230	9-055 118	9-094 488	9-133 858	9-173 228	9-212 598	9-251 968	9-291 339	9-330 709	9-370 079	9-409 449
240	9-448 819	9-488 189	9-527 559	9-566 929	9-606 299	9-645 669	9-685 039	9-724 409	9-763 780	9-803 150

TABLE IVA MILLIMETRES TO INCHES — *Contd*

Range: 1 to 1 000 mm

Milli- metres→ ↓	0	1	2	3	4	5	6	7	8	9
	in	in	in	in	in	in	in	in	in	in
250	9-842 520	9-881 890	9-921 260	9-960 629	10-000 000	10-039 370	10-078 740	10-118 110	10-157 480	10-196 850
260	10-236 220	10-275 591	10-314 961	10-354 330	10-393 701	10-433 071	10-472 441	10-511 811	10-551 181	10-590 551
270	10-629 921	10-669 291	10-708 661	10-748 031	10-787 402	10-826 772	10-866 142	10-905 512	10-944 882	10-984 252
280	11-023 622	11-062 992	11-102 362	11-141 732	11-181 102	11-220 472	11-259 842	11-299 213	11-338 583	11-377 953
290	11-417 323	11-456 693	11-496 063	11-535 433	11-574 803	11-614 173	11-653 543	11-692 913	11-732 284	11-771 654
300	11-811 024	11-850 394	11-889 764	11-929 134	11-968 504	12-007 874	12-047 244	12-086 614	12-125 984	12-165 354
310	12-204 724	12-244 094	12-283 465	12-322 835	12-362 205	12-401 575	12-440 945	12-480 315	12-519 685	12-559 055
320	12-598 425	12-637 895	12-677 165	12-716 535	12-755 906	12-795 276	12-834 646	12-874 016	12-913 386	12-952 756
330	12-992 126	13-031 596	13-070 866	13-110 236	13-149 606	13-188 976	13-228 346	13-267 716	13-307 087	13-346 457
340	13-385 827	13-425 297	13-464 567	13-503 937	13-543 307	13-582 677	13-622 047	13-661 417	13-700 787	13-740 158
350	13-779 528	13-818 998	13-858 268	13-897 638	13-937 008	13-976 378	14-015 748	14-055 118	14-094 488	14-133 858
360	14-173 228	14-212 698	14-251 968	14-291 339	14-330 709	14-370 079	14-409 448	14-448 819	14-488 189	14-527 559
370	14-566 929	14-606 399	14-645 669	14-685 039	14-724 409	14-763 780	14-803 150	14-842 520	14-881 890	14-921 260
380	14-960 630	15-000 000	15-039 370	15-078 740	15-118 110	15-157 480	15-196 850	15-236 220	15-275 591	15-314 961
390	15-354 331	15-393 701	15-433 071	15-472 440	15-511 811	15-551 181	15-590 551	15-629 921	15-669 291	15-708 661
400	15-748 032	15-787 402	15-826 772	15-866 142	15-905 512	15-944 882	15-984 252	16-023 622	16-062 992	16-102 362
410	16-141 732	16-181 102	16-220 472	16-259 842	16-299 213	16-338 583	16-377 953	16-417 323	16-456 693	16-496 063
420	16-535 433	16-574 803	16-614 173	16-653 543	16-692 913	16-732 284	16-771 654	16-811 024	16-850 394	16-889 764
430	16-929 134	16-968 504	17-007 874	17-047 244	17-086 614	17-125 984	17-165 354	17-204 724	17-244 094	17-283 464
440	17-322 835	17-362 205	17-401 575	17-440 945	17-480 315	17-519 685	17-559 055	17-598 425	17-637 795	17-677 165
450	17-716 535	17-755 906	17-795 276	17-834 646	17-874 016	17-913 386	17-952 756	17-992 126	18-031 496	18-070 866
460	18-110 236	18-149 607	18-188 976	18-228 346	18-267 716	18-307 087	18-346 457	18-385 827	18-425 197	18-464 567
470	18-503 937	18-543 307	18-582 677	18-622 047	18-661 417	18-700 787	18-740 158	18-779 528	18-818 898	18-858 268
480	18-897 638	18-937 008	18-976 378	19-015 748	19-055 118	19-094 488	19-133 858	19-173 228	19-212 598	19-251 968
490	19-291 339	19-330 709	19-370 079	19-409 449	19-448 819	19-488 189	19-527 559	19-566 929	19-606 299	19-645 669

TABLE IVA MILLIMETRES TO INCHES — *Contd*

Range: 1 to 1 000 mm

Milli- metres→ ↓	0	1	2	3	4	5	6	7	8	9
	in	in	in	in	in	in	in	in	in	in
<b>500</b>	19-685 039	19-724 409	19-763 780	19-803 150	19-842 520	19-881 890	19-921 260	19-960 630	20-000 000	20-039 370
<b>510</b>	20-078 740	20-118 110	20-157 480	20-196 850	20-236 220	20-275 591	20-314 961	20-354 331	20-393 701	20-433 071
<b>520</b>	20-472 441	20-511 811	20-551 181	20-590 551	20-629 921	20-669 291	20-708 661	20-748 032	20-787 402	20-826 772
<b>530</b>	20-866 142	20-905 512	20-944 882	20-984 252	21-023 622	21-062 992	21-102 362	21-141 732	21-181 102	21-220 472
<b>540</b>	21-259 842	21-299 213	21-338 583	21-377 953	21-417 323	21-456 693	21-496 063	21-535 433	21-574 803	21-614 173
<b>550</b>	21-653 543	21-692 913	21-732 284	21-771 654	21-811 024	21-850 394	21-889 764	21-929 134	21-968 504	22-007 874
<b>560</b>	22-047 244	22-086 614	22-125 984	22-165 354	22-204 724	22-244 094	22-283 465	22-322 835	22-362 205	22-401 575
<b>570</b>	22-440 945	22-480 315	22-519 685	22-559 055	22-598 425	22-637 795	22-677 165	22-716 535	22-755 906	22-795 276
<b>580</b>	22-834 646	22-874 016	22-913 386	22-952 760	22-992 126	23-031 496	23-070 866	23-110 236	23-149 606	23-188 976
<b>590</b>	23-228 346	23-267 716	23-307 087	23-346 457	23-385 827	23-425 197	23-464 567	23-503 937	23-543 307	23-582 677
<b>600</b>	23-622 047	23-661 417	23-700 787	23-740 158	23-779 528	23-818 898	23-858 268	23-897 638	23-937 008	23-976 378
<b>610</b>	24-015 748	24-055 118	24-094 488	24-133 858	24-173 228	24-212 598	24-251 968	24-291 339	24-330 709	24-370 079
<b>620</b>	24-409 449	24-448 819	24-488 189	24-527 559	24-566 929	24-606 299	24-645 669	24-685 039	24-724 409	24-763 780
<b>630</b>	24-803 150	24-842 520	24-881 890	24-921 260	24-960 630	25-000 000	25-039 370	25-078 740	25-118 110	25-157 480
<b>640</b>	25-196 850	25-236 220	25-275 591	25-314 961	25-354 331	25-393 701	25-433 071	25-472 441	25-511 811	25-551 181
<b>650</b>	25-590 551	25-629 921	25-669 291	25-708 661	25-748 032	25-787 402	25-826 772	25-866 142	25-905 512	25-944 882
<b>660</b>	25-984 252	26-023 622	26-062 992	26-102 362	26-141 732	26-181 102	26-220 472	26-259 842	26-299 213	26-338 583
<b>670</b>	26-377 953	26-417 323	26-456 693	26-496 063	26-535 433	26-574 803	26-614 173	26-653 543	26-692 913	26-732 284
<b>680</b>	26-771 654	26-811 024	26-850 394	26-889 764	26-929 134	26-968 504	27-007 874	27-047 244	27-086 614	27-125 984
<b>690</b>	27-165 354	27-204 724	27-244 094	27-283 465	27-322 835	27-362 205	27-401 575	27-440 945	27-480 315	27-519 685
<b>700</b>	27-559 055	27-598 425	27-637 795	27-677 165	27-716 535	27-755 906	27-795 276	27-834 646	27-874 016	27-913 386
<b>710</b>	27-952 756	27-992 126	28-031 496	28-070 866	28-110 236	28-149 606	28-188 976	28-228 346	28-267 716	28-307 087
<b>720</b>	28-346 457	28-385 827	28-425 197	28-464 567	28-503 937	28-543 307	28-582 677	28-622 047	28-661 417	28-700 787
<b>730</b>	28-740 158	28-779 528	28-818 898	28-858 268	28-897 638	28-937 008	28-976 378	29-015 748	29-055 118	29-094 488
<b>740</b>	29-133 858	29-173 228	29-212 598	29-251 968	29-291 339	29-330 709	29-370 079	29-409 449	29-448 819	29-488 189



TABLE IVA MILLIMETRES TO INCHES — *Contd*

Range: 1 to 1 000 mm

Milli- metres→	0	1	2	3	4	5	6	7	8	9
→	in	in	in	in	in	in	in	in	in	in
750	29-527 559	29-566 929	29-606 299	29-645 669	29-685 039	29-724 409	29-763 780	29-803 150	29-842 520	29-881 890
760	29-921 260	29-960 630	30-000 000	30-039 370	30-078 740	30-118 110	30-157 480	30-196 850	30-236 220	30-275 591
770	30-314 961	30-354 331	30-393 701	30-433 071	30-472 441	30-511 811	30-551 181	30-590 551	30-629 921	30-669 291
780	30-708 661	30-748 032	30-787 402	30-826 772	30-866 142	30-905 512	30-944 882	30-984 252	31-023 622	31-062 992
790	31-102 362	31-141 732	31-181 102	31-220 472	31-259 842	31-299 213	31-338 583	31-377 953	31-417 323	31-456 693
800	31-496 063	31-535 433	31-574 803	31-614 173	31-653 543	31-692 913	31-732 284	31-771 654	31-811 024	31-850 394
810	31-889 764	31-929 134	31-968 504	32-007 874	32-047 244	32-086 614	32-125 984	32-165 354	32-204 724	32-244 094
820	32-283 465	32-322 835	32-362 205	32-401 575	32-440 945	32-480 315	32-519 685	32-559 055	32-598 425	32-637 795
830	32-677 165	32-716 535	32-755 906	32-795 276	32-834 646	32-874 016	32-913 386	32-952 756	32-992 126	33-031 456
840	33-070 866	33-110 236	33-149 606	33-188 976	33-228 346	33-267 716	33-307 087	33-346 457	33-385 827	33-425 197
850	33-464 567	33-503 937	33-543 307	33-582 677	33-622 047	33-661 417	33-700 787	33-740 158	33-779 528	33-818 898
860	33-858 268	33-897 638	33-937 008	33-976 378	34-015 748	34-055 118	34-094 488	34-133 858	34-173 228	34-212 598
870	34-251 968	34-291 339	34-330 709	34-370 079	34-409 449	34-448 819	34-488 189	34-527 559	34-566 929	34-606 299
880	34-645 669	34-685 039	34-724 409	34-763 780	34-803 150	34-842 520	34-881 890	34-921 260	34-960 630	35-000 000
890	35-039 370	35-078 740	35-118 110	35-157 480	35-196 850	35-236 220	35-275 591	35-314 961	35-354 331	35-393 701
900	35-433 071	35-472 441	35-511 811	35-551 181	35-590 551	35-629 921	35-669 291	35-708 661	35-748 032	35-787 402
910	35-826 772	35-866 142	35-905 512	35-944 882	35-984 252	36-023 622	36-062 992	36-102 362	36-141 732	36-181 102
920	36-220 472	36-259 842	36-299 213	36-338 583	36-377 953	36-417 323	36-456 693	36-496 063	36-535 433	36-574 803
930	36-614 173	36-653 543	36-692 913	36-732 284	36-771 654	36-811 024	36-850 394	36-889 764	36-929 134	36-968 504
940	37-007 874	37-047 244	37-086 614	37-125 984	37-165 354	37-204 724	37-244 094	37-283 465	37-322 835	37-362 205
950	37-401 575	37-440 945	37-480 315	37-519 685	37-559 055	37-598 425	37-637 795	37-677 165	37-716 535	37-755 906
960	37-795 276	37-834 646	37-874 016	37-913 386	37-952 756	37-992 126	38-031 496	38-070 866	38-110 236	38-149 606
970	38-188 976	38-228 346	38-267 716	38-307 087	38-346 457	38-385 827	38-425 197	38-464 567	38-503 937	38-543 307
980	38-582 677	38-622 047	38-661 417	38-700 787	38-740 158	38-779 528	38-818 898	38-858 268	38-897 638	38-937 008
990	38-976 378	39-015 748	39-055 118	39-094 488	39-133 858	39-173 228	39-212 598	39-251 968	39-291 339	39-330 709
1 000	39-370 079									

TABLE IVB MILLIMETRES TO INCHES

Range: 0.001 to 1.000 mm

(Clauses 3.4 and 4.1)

Milli- metres→ ↓	0	0.001	0.002	0.003	0.004	0.005	0.006	0.007	0.008	0.009
	in	in	in	in	in	in	in	in	in	in
0	0	0.000 040	0.000 079	0.000 118	0.000 157	0.000 197	0.000 236	0.000 276	0.000 315	0.000 354
0.01	0.000 394	0.000 433	0.000 472	0.000 512	0.000 551	0.000 591	0.000 630	0.000 669	0.000 709	0.000 748
0.02	0.000 787	0.000 827	0.000 866	0.000 906	0.000 945	0.000 984	0.001 024	0.001 063	0.001 102	0.001 142
0.03	0.001 181	0.001 220	0.001 260	0.001 299	0.001 339	0.001 378	0.001 417	0.001 457	0.001 496	0.001 535
0.04	0.001 575	0.001 614	0.001 654	0.001 693	0.001 732	0.001 772	0.001 811	0.001 850	0.001 890	0.001 929
0.05	0.001 968	0.002 008	0.002 047	0.002 087	0.002 126	0.002 165	0.002 205	0.002 244	0.002 283	0.002 323
0.06	0.002 362	0.002 402	0.002 441	0.002 480	0.002 520	0.002 559	0.002 598	0.002 638	0.002 677	0.002 717
0.07	0.002 756	0.002 795	0.002 835	0.002 874	0.002 913	0.002 953	0.002 992	0.003 031	0.003 071	0.003 110
0.08	0.003 150	0.003 189	0.003 228	0.003 268	0.003 307	0.003 346	0.003 386	0.003 425	0.003 465	0.003 504
0.09	0.003 543	0.003 582	0.003 622	0.003 661	0.003 701	0.003 740	0.003 780	0.003 819	0.003 858	0.003 898
0.10	0.003 937	0.003 976	0.004 016	0.004 055	0.004 094	0.004 134	0.004 173	0.004 213	0.004 252	0.004 291
0.11	0.004 330	0.004 370	0.004 409	0.004 449	0.004 488	0.004 528	0.004 567	0.004 606	0.004 646	0.004 685
0.12	0.004 724	0.004 764	0.004 803	0.004 843	0.004 882	0.004 921	0.004 961	0.005 000	0.005 039	0.005 079
0.13	0.005 118	0.005 157	0.005 197	0.005 236	0.005 276	0.005 315	0.005 354	0.005 394	0.005 433	0.005 472
0.14	0.005 512	0.005 551	0.005 591	0.005 630	0.005 669	0.005 709	0.005 748	0.005 787	0.005 827	0.005 866
0.15	0.005 906	0.005 945	0.005 984	0.006 024	0.006 063	0.006 102	0.006 142	0.006 181	0.006 220	0.006 260
0.16	0.006 299	0.006 339	0.006 378	0.006 417	0.006 457	0.006 496	0.006 535	0.006 575	0.006 614	0.006 654
0.17	0.006 693	0.006 732	0.006 772	0.006 811	0.006 850	0.006 890	0.006 929	0.006 968	0.007 008	0.007 047
0.18	0.007 087	0.007 126	0.007 165	0.007 205	0.007 244	0.007 283	0.007 323	0.007 362	0.007 402	0.007 441
0.19	0.007 480	0.007 520	0.007 559	0.007 598	0.007 638	0.007 677	0.007 717	0.007 756	0.007 795	0.007 835
0.20	0.007 874	0.007 913	0.007 953	0.007 992	0.008 032	0.008 071	0.008 110	0.008 150	0.008 189	0.008 228
0.21	0.008 268	0.008 307	0.008 346	0.008 386	0.008 425	0.008 465	0.008 504	0.008 543	0.008 583	0.008 622
0.22	0.008 661	0.008 701	0.008 740	0.008 780	0.008 819	0.008 858	0.008 898	0.008 937	0.008 976	0.009 016
0.23	0.009 055	0.009 094	0.009 134	0.009 173	0.009 213	0.009 252	0.009 291	0.009 331	0.009 370	0.009 409
0.24	0.009 449	0.009 488	0.009 528	0.009 567	0.009 606	0.009 646	0.009 685	0.009 724	0.009 764	0.009 803

TABLE IVB MILLIMETRES TO INCHES — *Contd*

Range: 0.001 to 1.000 mm

Milli- metres→ ↓	0	0.001	0.002	0.003	0.004	0.005	0.006	0.007	0.008	0.009
	in	in	in	in	in	in	in	in	in	in
0.25	0.009 843	0.009 881	0.009 921	0.009 960	0.010 000	0.010 039	0.010 079	0.010 118	0.010 157	0.010 197
0.26	0.010 236	0.010 276	0.010 315	0.010 354	0.010 394	0.010 433	0.010 472	0.010 512	0.010 551	0.010 591
0.27	0.010 630	0.010 669	0.010 709	0.010 748	0.010 787	0.010 827	0.010 866	0.010 906	0.010 945	0.010 984
0.28	0.011 024	0.011 063	0.011 102	0.011 142	0.011 181	0.011 220	0.011 260	0.011 299	0.011 339	0.011 378
0.29	0.011 417	0.011 457	0.011 496	0.011 535	0.011 575	0.011 614	0.011 654	0.011 693	0.011 732	0.011 772
0.30	0.011 811	0.011 850	0.011 890	0.011 929	0.011 968	0.012 008	0.012 047	0.012 087	0.012 126	0.012 165
0.31	0.012 205	0.012 244	0.012 283	0.012 323	0.012 362	0.012 402	0.012 441	0.012 480	0.012 520	0.012 559
0.32	0.012 598	0.012 638	0.012 677	0.012 717	0.012 756	0.012 795	0.012 834	0.012 874	0.012 913	0.012 953
0.33	0.012 992	0.013 032	0.013 071	0.013 110	0.013 150	0.013 189	0.013 228	0.013 268	0.013 307	0.013 346
0.34	0.013 386	0.013 425	0.013 465	0.013 504	0.013 543	0.013 583	0.013 622	0.013 661	0.013 701	0.013 740
0.35	0.013 780	0.013 819	0.013 858	0.013 898	0.013 937	0.013 976	0.014 016	0.014 055	0.014 094	0.014 134
0.36	0.014 173	0.014 213	0.014 252	0.014 291	0.014 331	0.014 370	0.014 409	0.014 449	0.014 488	0.014 528
0.37	0.014 567	0.014 606	0.014 646	0.014 685	0.014 724	0.014 764	0.014 803	0.014 843	0.014 882	0.014 921
0.38	0.014 961	0.015 000	0.015 039	0.015 079	0.015 118	0.015 157	0.015 197	0.015 236	0.015 276	0.015 315
0.39	0.015 354	0.015 394	0.015 433	0.015 472	0.015 512	0.015 551	0.015 591	0.015 630	0.015 669	0.015 708
0.40	0.015 748	0.015 787	0.015 827	0.015 866	0.015 906	0.015 945	0.015 984	0.016 024	0.016 063	0.016 102
0.41	0.016 142	0.016 181	0.016 220	0.016 260	0.016 299	0.016 339	0.016 378	0.016 417	0.016 457	0.016 496
0.42	0.016 535	0.016 575	0.016 614	0.016 654	0.016 693	0.016 732	0.016 772	0.016 811	0.016 850	0.016 890
0.43	0.016 929	0.016 968	0.017 008	0.017 047	0.017 087	0.017 126	0.017 165	0.017 205	0.017 244	0.017 283
0.44	0.017 323	0.017 362	0.017 402	0.017 441	0.017 480	0.017 520	0.017 559	0.017 598	0.017 638	0.017 677
0.45	0.017 717	0.017 756	0.017 795	0.017 835	0.017 874	0.017 913	0.017 953	0.017 992	0.018 032	0.018 071
0.46	0.018 110	0.018 150	0.018 189	0.018 228	0.018 268	0.018 307	0.018 346	0.018 386	0.018 425	0.018 465
0.47	0.018 504	0.018 543	0.018 583	0.018 622	0.018 661	0.018 701	0.018 740	0.018 780	0.018 819	0.018 858
0.48	0.018 898	0.018 937	0.018 976	0.019 016	0.019 055	0.019 094	0.019 134	0.019 173	0.019 213	0.019 252
0.49	0.019 291	0.019 331	0.019 370	0.019 409	0.019 449	0.019 488	0.019 528	0.019 567	0.019 606	0.019 646

TABLE IVB MILLIMETRES TO INCHES — *Contd*

Range: 0.001 to 1.000 mm

Milli- metres→ ↓	0	0.001	0.002	0.003	0.004	0.005	0.006	0.007	0.008	0.009
	in	in	in	in	in	in	in	in	in	in
0.50	0.019 685	0.019 724	0.019 764	0.019 803	0.019 843	0.019 882	0.019 921	0.019 961	0.020 000	0.020 039
0.51	0.020 079	0.020 118	0.020 157	0.020 197	0.020 236	0.020 276	0.020 315	0.020 354	0.020 394	0.020 433
0.52	0.020 472	0.020 512	0.020 551	0.020 591	0.020 630	0.020 669	0.020 709	0.020 748	0.020 787	0.020 827
0.53	0.020 866	0.020 906	0.020 945	0.020 984	0.021 024	0.021 063	0.021 102	0.021 142	0.021 181	0.021 220
0.54	0.021 260	0.021 299	0.021 339	0.021 378	0.021 417	0.021 457	0.021 496	0.021 535	0.021 575	0.021 614
0.55	0.021 654	0.021 693	0.021 732	0.021 772	0.021 811	0.021 850	0.021 890	0.021 929	0.021 968	0.022 008
0.56	0.022 047	0.022 087	0.022 126	0.022 165	0.022 205	0.022 244	0.022 283	0.022 323	0.022 362	0.022 401
0.57	0.022 441	0.022 480	0.022 520	0.022 559	0.022 598	0.022 638	0.022 677	0.022 717	0.022 756	0.022 795
0.58	0.022 835	0.022 874	0.022 913	0.022 953	0.022 992	0.023 032	0.023 071	0.023 110	0.023 150	0.023 189
0.59	0.023 228	0.023 267	0.023 307	0.023 346	0.023 386	0.023 425	0.023 465	0.023 504	0.023 543	0.023 583
0.60	0.023 622	0.023 661	0.023 701	0.023 740	0.023 780	0.023 819	0.023 858	0.023 898	0.023 937	0.023 976
0.61	0.024 016	0.024 055	0.024 094	0.024 134	0.024 173	0.024 213	0.024 252	0.024 291	0.024 331	0.024 370
0.62	0.024 409	0.024 449	0.024 489	0.024 528	0.024 567	0.024 606	0.024 646	0.024 685	0.024 724	0.024 764
0.63	0.024 803	0.024 843	0.024 882	0.024 921	0.024 961	0.025 000	0.025 039	0.025 079	0.025 118	0.025 157
0.64	0.025 197	0.025 236	0.025 276	0.025 315	0.025 354	0.025 394	0.025 433	0.025 472	0.025 512	0.025 551
0.65	0.025 591	0.025 630	0.025 669	0.025 709	0.025 748	0.025 787	0.025 827	0.025 866	0.025 906	0.025 945
0.66	0.025 984	0.026 024	0.026 063	0.026 102	0.026 142	0.026 181	0.026 220	0.026 260	0.026 299	0.026 339
0.67	0.026 378	0.026 417	0.026 457	0.026 496	0.026 535	0.026 575	0.026 614	0.026 654	0.026 693	0.026 732
0.68	0.026 772	0.026 811	0.026 850	0.026 890	0.026 929	0.026 968	0.027 008	0.027 047	0.027 087	0.027 126
0.69	0.027 165	0.027 205	0.027 244	0.027 283	0.027 323	0.027 362	0.027 402	0.027 441	0.027 480	0.027 520
0.70	0.027 559	0.027 598	0.027 638	0.027 677	0.027 717	0.027 756	0.027 795	0.027 835	0.027 874	0.027 913
0.71	0.027 953	0.027 992	0.028 032	0.028 071	0.028 110	0.028 150	0.028 189	0.028 228	0.028 268	0.028 307
0.72	0.028 346	0.028 386	0.028 425	0.028 465	0.028 504	0.028 543	0.028 583	0.028 622	0.028 661	0.028 701
0.73	0.028 740	0.028 780	0.028 819	0.028 858	0.028 898	0.028 937	0.028 976	0.029 016	0.029 055	0.029 094
0.74	0.029 134	0.029 173	0.029 213	0.029 252	0.029 291	0.029 331	0.029 370	0.029 409	0.029 449	0.029 488

TABLE IVB MILLIMETRES TO INCHES — *Contd*

Range: 0.001 to 1.000 mm

IS : 1105 - 1957

Milli- metres→ ↓	0	0.001	0.002	0.003	0.004	0.005	0.006	0.007	0.008	0.009
	in	in	in	in	in	in	in	in	in	in
<b>0.75</b>	0.029 528	0.029 567	0.029 606	0.029 646	0.029 685	0.029 724	0.029 764	0.029 803	0.029 843	0.029 882
<b>0.76</b>	0.029 921	0.029 961	0.030 000	0.030 040	0.030 079	0.030 118	0.030 157	0.030 197	0.030 236	0.030 276
<b>0.77</b>	0.030 315	0.030 354	0.030 394	0.030 433	0.030 472	0.030 512	0.030 551	0.030 591	0.030 630	0.030 669
<b>0.78</b>	0.030 709	0.030 748	0.030 787	0.030 827	0.030 866	0.030 906	0.030 945	0.030 984	0.031 024	0.031 063
<b>0.79</b>	0.031 102	0.031 142	0.031 181	0.031 220	0.031 260	0.031 299	0.031 339	0.031 378	0.031 417	0.031 457
<b>0.80</b>	0.031 496	0.031 535	0.031 575	0.031 614	0.031 654	0.031 693	0.031 732	0.031 772	0.031 811	0.031 850
<b>0.81</b>	0.031 890	0.031 929	0.031 968	0.032 008	0.032 047	0.032 087	0.032 126	0.032 165	0.032 205	0.032 244
<b>0.82</b>	0.032 283	0.032 323	0.032 362	0.032 402	0.032 441	0.032 480	0.032 520	0.032 559	0.032 598	0.032 638
<b>0.83</b>	0.032 677	0.032 717	0.032 756	0.032 795	0.032 835	0.032 874	0.032 913	0.032 953	0.032 992	0.033 032
<b>0.84</b>	0.033 071	0.033 110	0.033 150	0.033 189	0.033 228	0.033 268	0.033 307	0.033 346	0.033 386	0.033 425
<b>0.85</b>	0.033 465	0.033 504	0.033 543	0.033 583	0.033 622	0.033 661	0.033 701	0.033 740	0.033 780	0.033 819
<b>0.86</b>	0.033 858	0.033 898	0.033 937	0.033 976	0.034 016	0.034 055	0.034 094	0.034 134	0.034 173	0.034 213
<b>0.87</b>	0.034 252	0.034 291	0.034 331	0.034 370	0.034 409	0.034 449	0.034 488	0.034 528	0.034 567	0.034 606
<b>0.88</b>	0.034 646	0.034 685	0.034 724	0.034 764	0.034 803	0.034 843	0.034 882	0.034 921	0.034 961	0.035 000
<b>0.89</b>	0.035 039	0.035 079	0.035 118	0.035 157	0.035 197	0.035 236	0.035 276	0.035 315	0.035 354	0.035 394
<b>0.90</b>	0.035 433	0.035 472	0.035 512	0.035 551	0.035 591	0.035 630	0.035 669	0.035 709	0.035 748	0.035 787
<b>0.91</b>	0.035 827	0.035 866	0.035 906	0.035 945	0.035 984	0.036 023	0.036 063	0.036 102	0.036 142	0.036 181
<b>0.92</b>	0.036 220	0.036 260	0.036 299	0.036 339	0.036 378	0.036 417	0.036 457	0.036 496	0.036 535	0.036 575
<b>0.93</b>	0.036 614	0.036 654	0.036 693	0.036 732	0.036 772	0.036 811	0.036 850	0.036 890	0.036 929	0.036 968
<b>0.94</b>	0.037 008	0.037 047	0.037 087	0.037 126	0.037 165	0.037 205	0.037 244	0.037 283	0.037 323	0.037 362
<b>0.95</b>	0.037 402	0.037 441	0.037 480	0.037 520	0.037 559	0.037 598	0.037 638	0.037 677	0.037 717	0.037 756
<b>0.96</b>	0.037 795	0.037 835	0.037 874	0.037 913	0.037 953	0.037 992	0.038 032	0.038 071	0.038 110	0.038 150
<b>0.97</b>	0.038 189	0.038 228	0.038 268	0.038 307	0.038 346	0.038 386	0.038 425	0.038 465	0.038 504	0.038 543
<b>0.98</b>	0.038 583	0.038 622	0.038 661	0.038 701	0.038 740	0.038 780	0.038 819	0.038 858	0.038 898	0.038 937
<b>0.99</b>	0.038 976	0.039 016	0.039 055	0.039 094	0.039 133	0.039 173	0.039 213	0.039 252	0.039 291	0.039 331
<b>1.000</b>	0.039 370 1									